

Advancement Of Affordable Housing

The advancement of affordable housing has been a focus in economics and design since the Great Depression in the United States. This advancement of affordable housing was in the previous century largely explored by some of our most notable architects, engineers, and businessmen. From the Usonian Homes of Frank Lloyd Wright, to the advancement of social thinking through design sought by Le Corbusier in, "Towards a New Architecture." Both Wright and Le Corbusier searched for, and professed, for an optimization in design and construction. Each with the own varying level of prefabrication and modularity in practiced design.

Residential construction in the United States, follows a history and social narrative not present in other post industrial or even developing nations. The concept of individual home ownership and to a large extent individual property as a right is a fundamental tenant of American value. This tenant is commonly referred to as the American Dream. Innovations in new design and construction methodologies is needed to address social and economic factors of today and tomorrow. New philosophical understandings of value, and adaption and development of design methods may provide useful in the bridging of shortcomings of current practices. New methodologies have a need to express economy, and be socially progressive in application.

"Machinery contains in itself the factor of economy, which make for its selection. The house is a machine for living in. We must aim at the fixing of standards in order to face the problem of perfection.... Architecture operates in accordance with standards. Standards are a matter of logic, analysis and minute study; they are based on a problem which has been well stated."

Le Corbusier, Towards a New Architecture, 1931.

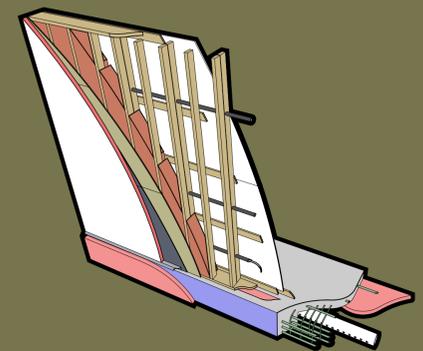
Construction

Wall construction used in the home is a modified staggered stud stick frame. The wall uses nominal size two by fours for studding material; which are spaced at twelve inch on center for exterior side, and twenty-four inches on interior side. The wall also employs boxed corners for ease of union and strength. The base, top, and crown plates, are two by eights, number two, SPF, with an actual width of 7.25 inches. This type of farming poses advantages over traditional two by four or two by six construction. The use of wider plates allows a wall that is deeper. This allows the use of thicker insulation materials, resulting in a higher final R value than is available with traditional stud wall construction. The use of a staggered stud configuration creates a thermal break, increasing the interior comfort of the completed wall. The wall includes the use of furring strips on the interior portion of the construction. This adds lateral bracing the wall and creates a thermal and acoustical break within the wall. The furring strips are spaced to support five by ten sheets of 5/8th thick drywall. The insulation specified in the home is 7.25 inch thick Rockwool with a maximum R value of R30. Rockwool is a highly fire resistant material produced from industrial waste. The cost of the finished wall is comparable to a traditional two by six wall construction. The exterior sheathing is 7/16th oriented strand board (OSB). The use of 7/16th OSB allows for runs of up to twelve feet without a need for a break in sheathing. This greatly improves the overall strength of the wall, and lowers the construction and time and cost. This should also minimize waste. The exterior vapor barrier is thirty pound impregnated felt paper. This was found to be appropriate for use, and lesser cost than other barrier types. The interior wall uses 5/8ths drywall in five by ten sheets. With the use of a ten foot stud, this optimizes the layout by decreasing the number of individual sheets of drywall need. This also minimizes the number of joints to finish or crack. Three and a half inch base molding is used to finish the interior wall. The exterior cladding is insulated panels with a concrete facing, dyed white. This increases the R value and decreases the need for exterior maintenance.

The wall construction also includes inch and a half non metallic tubing, at eighteen inches, forty-eight inches, and eight feet. This eases the possible future expansion of either electrical or communications used in the home. This also decreases the chance of screws or nails piercing wiring while hanging drywall or pictures. The final R Value for the completed construction is a R46, which is over the minimum requirements for North Dakota, with standard as R20.

The roof framing in the home uses web truss construction. This was found to cost more than using I trusses, but offers a higher load capacity and space for mechanical and environmental services.

The foundation is a floating slab with bond beam edge. The slab is six inches thick and the beam is a twelve by eight. This was found to be the lowest cost option. Number eight rebar is placed every twelve inches in a grid pattern, in the lower third of the slab. The rebar is tied back to the edge bond beam every six inches. All rebar is urethane coated. Two inch foam insulation is placed along the parameter and underneath the slab to prevent thermal bridging and add to the comfort of the occupants.



The home has a force hot air gas furnace rated at 750000 BTUs and an air conditioner rated at 500000 BTUs. The system uses twelve by eighteen steel ducts, with eight inch round registers in all rooms except the main living area. The register for the main living area is twelve by eighteen. The system return is done by a vent in mechanical room door. This system is larger than is needed by the total square footage of the home. This makes it possible to expand the home without a need to buy new environmental equipment.

Plumbing in the home follows standard practices for waste and drain. Water supply lines are PEX with a hot and cold supply manifold in the Mechanical room. This greatly reduces the rough in time and cost. This method also minimizes the chance of leaking or bursting pipes in inaccessible areas. The sewer can be either connected to a city waste line, or septic system. The addition of a septic system would cost 35000 dollars more. The unique framing of the home incorporates wet walls between the mechanical room and half bath, and smaller bedroom and master bath. This was done to house plumbing and vents. This also allows for an acoustic break that should isolate unwanted noise.

The home has a 350 amp electrical service. This is above what is needed for home size, but allows for future expansion of the home without a need to update or add a new service. All wiring in the home is 10/3 machine tool wire (MTW). This wire is of a higher quality than standard romex, but offers the ability for tight bend radiuses and a continual flex rating. All plugs in the home are arc fault type with ground faults in kitchen and bathrooms. Crows foot services are placed in both the kitchen for oven and in mechanical for clothes dryer. Lighting is done by standard sixty watt fixtures in all rooms, with under cabinet lighting in the kitchen.

